

The use of chemicals or drugs on fish intended for human or animal consumption must be in accordance with current laws and regulations.

Use of trade names does not imply U.S. Government endorsement of commercial products.

SUGGESTED READING

Bullock, G. L. 1986. Columnaris disease of fishes. U.S. Fish and Wildlife Service, Fish Disease Leaflet 72. 9 pp.

Detailed description of columnaris disease that includes cause, clinical signs, range (host and geographic), transmission, and control.

Bullock, G. L., D. A. Conroy, and S. F. Snieszko. 1971. Bacterial diseases of fishes. Book 2A (151 pp.) in S. F. Snieszko and H. R. Axelrod, eds. Diseases of fishes. T. F. H. Publications, Inc., Neptune City, N.J.

Includes a detailed description of columnaris and recommended treatments.

Meyer, F. P. 1970. Seasonal fluctuations in the incidence of disease on fish farms. Pages 21-29 in S. F. Snieszko, ed. A symposium on diseases of fishes and shellfishes. American Fisheries Society Special Publication 5.

Case histories during a 5-year period showed that infections in pondfishes were most common in April during spawning, and again in late summer when pond conditions were poor and oxygen concentrations low.

Wedemeyer, G. A. 1974. Stress as a predisposing factor in fish diseases. U.S. Fish and Wildlife Service, Fish Disease Leaflet 38. 8 pp.

Crowding and handling of fish at 59° F or above are stress factors that contribute to outbreaks of columnaris.

Wood, J. W. 1974. Diseases of Pacific salmon, their prevention and treatment. Washington Department of Fisheries, Olympia.

Diagnosis and control methods for columnaris are described.

English to Metric Conversion Units

- 1 inch = 2.54 centimeters
 - 1 foot = 30.5 centimeters or 0.305 meters
 - 1 acre = 0.405 hectare or 43,560 square feet
 - 1 cubic foot = 7.48 U.S. liquid gallons, 28.3 liters, or 28,315 cubic centimeters (cm³)
 - 1 U.S. liquid ounce = 29.57 milliliters
 - 1 U.S. liquid quart = 0.946 liter
 - 1 U.S. liquid gallon = 3.785 liters or 231 cubic inches or 128 fluid ounces or 8.35 pounds or 3,785 grams
 - 1 cubic foot of water = 62.4 pounds or 28.3 kilograms
- Fahrenheit (F) to Celsius (C) = (Fahrenheit - 32) × 5/9;
0° C = 32° F.



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COLUMNARIS
DISEASE OF FISHES

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INTRODUCTION

Columnaris disease is a bacterial infection of warm-water fishes, trout, and anadromous fishes (which move from the sea up freshwater streams to spawn). The disease may be mild or severe, and of short or long duration. The causative organism was first isolated in 1944 and named on the basis of its appearance when viewed with a microscope—that is, the bacteria form columns on a microscope slide. It was later named *Flexibacter columnaris*.

DIAGNOSIS AND IDENTIFICATION

Columnaris disease begins on body surfaces and gills; the types of lesions (sores) vary with species of fish. In scaleless fish such as the catfishes, the first lesions are small and circular and have gray-blue, decayed centers and red margins surrounded by a ring of inflamed skin. As the disease progresses, the lesions spread and may cover most of the body. In scaled fish, such as largemouth bass, decay begins at the outer margins of the fins and spreads inward toward the body. In advanced cases, the bacteria penetrate the skin and destroy muscle and small blood vessels.

In Pacific salmon and warmwater pondfishes, columnaris disease commonly causes extensive gill destruction (Figure). Characteristic changes associated with the lesions are congested blood vessels and scattered hemorrhages.

As gill and muscle tissues are destroyed, the bacteria become internal. Bacterial cells usually cannot be seen in stained microscope smears, but can be readily cultured in the laboratory.

CAUSE OF THE DISEASE

Preliminary diagnosis of columnaris disease is based on the appearance of lesions, and (when infected tissue is viewed microscopically) the presence of long, thin bacteria that form characteristic columns. A positive diagnosis requires laboratory isolation.

SOURCE OF INFECTION

Flexibacter columnaris commonly occurs in water, soil, and fish. Its survival depends principally on temperature, water hardness, acidity, and other factors. In the laboratory, it lived longer at 50° F than at 72° F. Fish are the

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Destruction of gill tissue in striped bass caused by *Flexibacter columnaris*.

primary carriers of the organism. Coarse fish, such as suckers, are the principal source of infection in Pacific salmon. Bacteria are shed into the water from the lesions of infected fish. High temperatures and the crowding of fish favors the release of bacteria.

TRANSMISSION

Columnaris disease is principally transmitted from fish to fish. But factors such as temperature and the chemical characteristics of the water affect the release of bacteria. For example, when steelhead and coho salmon were experimentally infected with columnaris, more of the fish died at 68° F than at 53° F. The disease also becomes more severe when fish are exposed to low dissolved oxygen or high ammonia concentrations.

GEOGRAPHIC DISTRIBUTION

Columnaris disease is common in fresh and brackish waters throughout the world, and affects most species of freshwater fishes and migrating salmonids. Eels are highly susceptible when they are held in fresh or brackish water. The disease is common in various pondfishes in the United States and in common carp in Europe.

PREVENTION

Columnaris disease is difficult to prevent because the bacterium is widespread in freshwater fishes and their

environment. However, temperature is an important factor in limiting the disease. For example, it is not a problem in salmonids cultured at temperatures below 50° F. In contrast, it is a major problem in cultured warmwater fishes and in Pacific salmon returning to their spawning grounds.

The development or progression of columnaris that sometimes results from handling fish can be prevented by adding copper sulfate to pond water at 0.5 part per million (ppm; 1:2,000,000), or treating the fish in a 20-min bath of copper sulfate at 37 ppm (1:27,000). The addition of 2 ppm (1:500,000) potassium permanganate to pond water has also been recommended.

Although the development of a commercial vaccine seems feasible, none is yet available.

TREATMENT

Columnaris can be treated with a wide variety of drugs and antibiotics. Although a number of chemicals and antibacterials are effective for the control of external or internal infections, none are registered with the U.S. Food and Drug Administration. External treatments are possible only in the early stages of the disease, when infection is limited to the fish's body surface. One such treatment for salmonids is with the herbicide Diquat, diluted to 8.4 ppm (1:119,000) active ingredient. One-hour treatments should be repeated on each of 4 consecutive days.

Copper sulfate at 0.5 ppm and potassium permanganate at 2-4 ppm are among the older chemicals used for treatment and prevention of columnaris disease in pondfishes. These chemicals are added to ponds and allowed to dissipate over time.

The amount of organic material in water influences the effectiveness of potassium permanganate. Methods are now available for estimating the organic load and adjusting the level of the chemical.

Oxytetracycline (Terramycin), given orally with food at a rate of 2.5-3.5 g/100 lb of fish per day for up to 10 days, is effective in both early and advanced outbreaks.

NOTE: A fish disease specialist should be consulted for diagnostic assistance whenever a disease is suspected and before chemical treatments are used.